U.S. DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

DRAFT ENVIRONMENTAL ASSESSMENT

for

AERIAL APPLICATION OF GLYPHOSATE FOR CONTROL OF PHRAGMITES ON BEAR RIVER MIGRATORY BIRD REFUGE

Prepared By

Howard Browers

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SECTION 1. PURPOSE AND NEED FOR ACTION

1.1 Purpose

This Environmental Assessment (EA) addresses the aerial application of glyphosate to control Phragmites (*Phragmites australis*) on Bear River Migratory Bird Refuge. It is prepared in compliance with the National Environmental Policy Act of 1969, as amended, and in accordance with Title 40, Code of Federal Regulations, Part 1500-1508 and with the US Fish and Wildlife Service's Manual Chapter on Integrated Pest Management (569 FW 1).

Bear River Migratory Bird Refuge is located on the northeast arm of the Great Salt Lake approximately 50 miles north of Salt Lake City, Utah (Figure 1). The Refuge is approximately 74,000 acres in size. The Refuge's office is located at 2155 W. Forest St., Brigham City, Utah.

The purpose of this EA is to analyze the environmental effects of alternatives for use in controlling Phragmites on Bear River Migratory Bird Refuge in northern Utah. Aerial application of glyphosate would be part of a larger integrated pest management plan for the control of Phragmites.

1.2 Need

Bear River Migratory Bird Refuge is the largest freshwater component of the Great Salt Lake ecosystem and is located in the Bear River Bay in the northeast arm of the Great Salt Lake. The Bear River Bay encompasses 112,000 acres of the Bear River Delta (Kadlec and Adair 1993). The delta is a mosaic of freshwater marshes, river channels and alkali salt flats. The Refuge serves a vital role in the Bear River delta ecosystem by protecting, developing and managing over 74,000 acres of freshwater wetlands, alkali mudflats, and uplands (Figure 2). Large population segments of waterfowl, shorebirds, and other waterbirds utilize the refuge as a breeding, staging, and wintering area. Two hundred ten species of birds regularly visit the Refuge. Sixty-seven bird species are known to nest and another 10 species are considered accidental or rare.

Phragmites australis (common reed) is a world-wide distributed perennial grass that has been present in North America for over 10,000 years (Neiring and Warren 1980). However, the distribution and abundance of Phragmites has increased rapidly over the last 150 years (Marks et al. 1994, Chambers et al. 1999, Lelong et al. 2007) including northern Utah where Phragmites is widespread and often dominant in wetlands, ditches and roadsides (Kulmatiski et al. 2010, Kettenring and Mock 2012, Long et al. 2012).

Phragmites is highly invasive because it is an efficient colonizer of disturbed soils and acts as a climax species thereby forming extensive monocultures that reduce plant and animal biodiversity (Best et al. 1981, Hara et al. 1993, Marks et al. 1994, Ailstock 2000). The aggressive nature of

Phragmites is directly attributable to a combination of morphological features that is unique among herbaceous hydrophytes. Phragmites produces abundant, small, wind dispersed, viable seeds which makes it an outstanding colonizing species of disturbed wetland soils. Recent research on the refuge has shown that seed dispersal is a more significant component of Phragmites spread on the refuge than was originally thought (Kettenring and Mock 2011). Rhizomes and stolons provide a secondary source of propagules and allow the plant to rapidly spread to occupy preferred microhabitats. Additionally, the persistence of tall standing dead stems and the buildup of Phragmites litter over time in the understory can reduce or even eliminate light penetration which reduces competition by other plant species (Ailstock 2000).

Phragmites occupies an estimated 3,000 to 4,000 acres on the refuge (Figures 3-5) and is present in nearly all management units and most water delivery canals (Olson 2007, Long et. al. 2012). Phragmites stands are also present on dike slopes surrounding wetland units. The area occupied and density of Phragmites stands varies by wetland unit, however, Phragmites has significantly displaced desired native plants such as alkali bulrush or inland salt grass in some units causing a reduction in foraging and nesting habitat for migratory birds. In some wetland units Phragmites makes up more than 50% of the total emergent wetland vegetation (Olson 2007, Long et al. 2012). Phragmites and has also invaded normally non-vegetated mudflats reducing the foraging area available to shorebirds. Left unchecked, Phragmites will continue to increase on the refuge and further degrade and reduce availability of vital habitat for migratory birds.

SECTION 2. PROPOSED ACTION AND THE ALTERNATIVES

2.1 Alternative A: No Aerial Spraying (No Action Alternative)

The No Action Alternative does not mean that there will be no treatment of Phragmites, but rather that the Refuge will continue to use current methods that include ground spray from tractor, truck, or ATV. Some flooded areas will be treated using tracked vehicles or airboats. Grazing, mowing, and prescribed fire would be used to reduce top growth to allow for better herbicide contact.

2.2 Alternative B: Aerial Application of glyphosate (Preferred Alternative)

Aerial application of glyphosate would be used as a tool to control areas of Phragmites that are generally greater than 20 acres and/or inaccessible to other forms of treatment. Approximately one half of the 3,000 to 4,000 acres of Phragmites on the refuge would be considered for aerial treatment. The intent would be to use broadcast aerial spraying for multiple years for approximately 5-10 years in order to reduce Phragmites cover to a level where only spot treatments would be required. These spot treatments could then be carried out either using ground equipment or using occasional aerial treatments as needed. The Refuge employs an integrated approach for Phragmites treatment and uses prescribed fire, grazing and mechanical methods as well as the application of herbicides.

SECTION 3. AFFECTED ENVIRONMENT

Bear River Migratory Bird Refuge was established by a 1928 Presidential Proclamation and Public Law 304 of the 70th Congress as "a suitable refuge and feeding, and breeding grounds for migratory wild fowl".

The Comprehensive Management Plan (Fish and Wildlife Service 1997) outlined 3 major goals for the refuge:

1. To provide for the life requirements of migratory birds.

2. To provide opportunities for the public, of all abilities, to observe, appreciate and understand wildlife and people's roles in the environment, compatible with refuge purposes.

3. To protect and interpret archeological, historical, and other cultural resources.

3.1 Physical Environment

Watershed

Bear River Migratory Bird Refuge encompasses most of the valley floor between the Wellsville Mountain Range to the east and the Promontory Mountain Range to the west. All refuge lands are part of the floor of the ancient Lake Bonneville.

The Refuge lies in the delta of the Bear River where it enters the Great Salt Lake, the world's second largest inland body of salt water. The Bear River originates in the Uintah Mountains of northeastern Utah and flows northerly in a loop through parts of Wyoming and Idaho and then back into Utah before emptying into the north end of the Great Salt Lake at Bear River Bay.

Waters from the Bear River account for over 50 percent of the annual flow into the Great Salt Lake (Sigler et al. 1996). The Bear River is the western hemisphere's largest river system not flowing into an ocean. The Bear River drainage basin covers an area about 4.8 million acres in size in three states.

Annual precipitation on the Refuge is relatively light (about 12.5 inches) therefore, residual snow in the surrounding Wasatch Mountains is critical to recharge the Bear River watershed which supplies the water to the Refuge throughout the summer. A reliable and sufficient fresh-water supply is necessary to sustain the long term health of the Bear River delta. Management or manipulation of the water supply is key to successful habitat management on the Refuge and adjacent wetland areas, therefore diligent attention to water issues that may impact the Refuge's supply and use are critical.

Ecoregion

Bear River Refuge is located in the Great Basin ecoregion. This area is dry due to its position in the rain shadow of the Cascade Range and the Sierra Nevada. These ranges relieve the air of most of its moisture before it reaches the Great Basin. Each mountain range provides an altitudinal series of climates. The plant species and subsequent bird species of this province change as a function of altitude. The wide range of altitudes in the Great Basin allows for diverse vegetative communities. Grasslands, sagebrush, and other xeric shrubs dominate the flats and lowlands, with pinyon-juniper (*Pinus-Juniperus*) woodlands and open ponderosa pine (*Pinus ponderosa*) forests on higher slopes. Lodgepole pine (*Pinus contorta*), sub-alpine fir (*Abies* spp.) forests occur at higher elevations on north-facing slopes. Big sagebrush (*Artemisia tridentata*) dominates much of the landscape though other shrubs such as rabbitbrush (*Chrysothamnus spp.*), saltbush (*Atriplex spp.*), and greasewood (*Sarcobatus vermiculatus*) may dominate some areas.

Despite its aridity, the Great Basin has some marshes like Bear River Refuge that add aquatic plant species to the already diverse vegetative community. Kaltwasser (1977) identified ten plant community types in a detailed study of Bear River Refuge.

Urban and agricultural habitats occur at the lower elevations of the Great Basin, primarily along the Wasatch front on the eastern side of the ecoregion. More than 70 percent of the population of Utah lives in this area of the state.

Soils

There are 21 soil types on the Refuge. These soil types are grouped into six ecological or range sites: Wetland, Saltair Mudflat, Semi-desert Alkali Knoll, Wet Meadow, Alkali Bottom, and Salt Meadow. Each ecological site produces a unique plant community. The ecological sites are important to differentiate as they afford the opportunity to examine the potential climax plant community and subsequent potential wildlife use.

Topography

The topography of the Refuge is nearly flat, with a gradient of approximately one foot per mile fall to the south. There is only about six feet of fall in the river from the northern boundary of the refuge to the mouth of the delta. The river area is represented by many oxbows and meanders. Water tables in the vicinity are high, and groundwater aquifers receive recharge from high flows and seepage losses from the river system. Maximum natural elevation on the Refuge occurs in the northwest corner where knolls raise to an elevation of about 4215 feet msl. Most of the refuge is around the 4202 feet msl contour.

Climate

In general, the area has a semiarid climate with four well-defined seasons typified by moderate spring and fall seasons, short cold winters, and hot dry summers. National Weather Service records for Salt Lake City indicate an annual mean relative humidity of 43 percent. Humidity

levels are lowest during July and August at 22 percent and 23 percent respectively. The average annual evaporation is about 54 inches on the refuge.

Maximum temperatures of 90 degrees or higher occur an average of 53 days each year with July and August being the hottest months. Evening and nighttime temperatures during the summer range in the 40s-60s. Winters are cold, though not normally severe, averaging 128 days at or below freezing. Evening and nighttime temperatures during the winter months range in the 20s-30s. There are, on average, 151 freeze-free days on the Refuge (1937-1984).

Annual precipitation at the west end of the Refuge is approximately 12.7 inches, while the average at the eastern end near Brigham City is 17.8 inches. The bulk of the moisture falling over the area can be attributed to the movement of Pacific storms during the winter and spring months (cold season). Due to the winter precipitation pattern, the spring growing season is short (about six weeks). Most summer precipitation comes from thunderstorms. Snowfall is generally light on the refuge, compared to the higher elevations, averaging 21 inches. Winds are generally moderate (less than 20 mph) though strong gusty winds may be present during summer thunderstorms. The average annual wind speed is 8.9 mph. The prevailing wind is SE or SSE.

3.2 Biological Environment

The Bear River delta has long been recognized as a wetland of great value to waterbirds in the Intermountain West region. Early explorer John C. Fremont witnessed such a large concentration of birds that he wrote in 1843, "...the waterfowl made this morning a noise like thunder...as the whole morass was animated with multitudes of waterfowl" (Fremont 1845). Captain Stansbury while completing a survey of the Great Salt Lake remarked on October 22, 1849 as he looked out over Bear River Bay that "it was covered by immense flocks of wild geese and ducks among which many swans were seen being distinguishable by their size and the whiteness of their plumage. I had seen large flocks of these birds before, in various parts of the country, and especially on the Potomac, but never did I behold anything like the immense numbers here congregated together. Thousands of acres, as far as the eye could reach, seemed literally covered with them, presenting a scene of busy, animated cheerfulness" (Stansbury 1852).

In 1992, the Refuge, in conjunction with other portions of the Great Salt Lake, was recognized for its importance to shorebirds when it was designated a Western Hemisphere Shorebird Reserve Network Site. Shorebird numbers often reach into the hundreds of thousands during fall migration (unpublished refuge records). Shuford et al. (1994), referring to a peak count of 30,000 Marbled Godwits (*Limosa fedoa*) recorded on the refuge, noted that the Great Salt Lake provides the only major staging area for Marbled Godwits in the interior of North America.

The average breeding population of American Avocets (*Recurvirostra americana*) on the refuge is about 4,800 birds (1956-2002, unpublished refuge records). The mean number of Avocets detected on the Refuge during the non-breeding season is greater than13,000 (Paul and Manning 2002). These figures represent 1 percent and 13 percent respectively, of the continental population (Brown et al. 2000).

The Refuge, as part of the delta, has sustained large numbers of nesting ducks throughout its history. Weller (1964) noted the delta marshes had the most outstanding concentrations of breeding redheads (*Aytha americana*) reported anywhere in North American, while Bellrose (1980) recognized northern Utah marshes as important to breeding cinnamon teal (*Anas cyanoptera*).

Refuge wetlands sustain aquatic plant and animal food resources for birds. The invertebrate populations provide protein the birds require for egg laying and molt during and after the breeding season. Midges (*Chironomid* spp.) are so abundant, that flying adults often form tornado like, black clouds along the Refuge roads (B. Olson, pers.obsv.). The nearby salt laden environment of the Great Salt Lake produces high-quality protein in the form of brine flies (*Ephydra cinerea*), and brine shrimp (*Artemia fransiscana*). John C. Fremont, while approaching Fremont island in the Great Salt Lake, noted "a 10-20 foot swath of dark-brown color" on the beach. "Being more closely examined, this was found to be composed, to the depth of seven or eight, and twelve inches, entirely of the larvae of insects or in common language, of the skins of worms, about the size of a grain of oats, which had been washed up by the waters of the lake" (Fremont 1845). These invertebrate species are important food resources for shorebirds (Helmers 1992).

Refuge impoundments support dense stands of sago pondweed (*Stuckenia pectinatus*). All parts of this plant, the leaves, seeds, and tubers, are eaten to obtain energy for long migration treks. The plant is recognized worldwide as an important waterfowl food (Kantrud 1990). The fish population provides food for fish-eating birds like American white pelican (*Pelecanus erythrorhyncho*) egrets, herons, and bald eagles (*Haliaeetus leucocephalus*). The Refuge is likely the most important or key foraging location for the Great Salt Lake breeding colony of American white pelican (Frank Howe, Utah Department of Wildlife Resources, personal communication).

In addition to the Bear River delta wetlands, the Refuge also encompasses approximately 3,000 acres of uplands adjacent to the delta. When restored to historic vegetation community composition (70-75 percent grasses and 25-30 percent shrubs), these uplands are expected to contribute to local and regional breeding bird diversity, abundance and success.

Taking into consideration the paucity of freshwater wetlands in the Intermountain West, Great Basin, as well as the Great Salt Lake ecosystem, and the documented importance of the refuge to the conservation of a number of nesting, resting, feeding, and staging waterbirds, the highest and best use would be to continue managing the refuge as a functioning freshwater wetland.

A comprehensive habitat management plan was prepared in 2004 (Olson et al. 2004). Management practices are generally based on the needs of priority waterbird species (Table 1) and include active manipulation of wetland habitats in order to mimic, as closely as possible, the historic and natural hydrologic processes of the Bear River Delta and adjacent grasslands.

3.3 Endangered species

No federal or state listed Threated and Endangered species currently occur on Bear River Migratory Bird Refuge.

3.4 Social and Economics

Portions of the Refuge are open to public recreation involving hunting, fishing, wildlife viewing, photography, and environmental education. Visitor use occurs year round but is particularly heavy during the fall hunting and spring migration season. Current estimate of annual public use is approximately 100,000 visitors.

All economic uses on the Refuge are for the benefit of wildlife management. The primary economic use is grazing. Winter grazing occurs on a small portion of the refuge. Summer grazing was instituted in 2012 on a small portion of the refuge for Phragmites management. The long-term plan is to continue livestock grazing for habitat management purposes.

SECTION 4. ENVIRONMENTAL CONSEQUENCES

4.1 Toxicity to Humans and Wildlife

Health issues associated with pesticides in general is a serious concern that needs to be considered at all times regardless of whether the pesticide (in this case the herbicide glyphosate) is applied through a ground application under Alternative A (No Action alternative) or through an aerial application as proposed under Alternative B (Preferred alternative). Considerations include the effect of direct contact at the time of application, as well as the lasting effect within the environment.

Glyphosate is a non-selective herbicide used to control many annual and perennial weeds and woody plants. The chemical is absorbed by the leaves of actively growing plants and moves quickly through the plant. It prevents the plant from producing amino acids that are the building blocks of plant proteins - resulting in death to the plant.

Glyphosate is the most used herbicide in the United States (Grube et al. 2011) and is marketed worldwide under many trade names. The more common ones are Roundup, Buccaneer, Rodeo, AquaNeat, and AquaMaster. The formulation being proposed for aerial application is 53.8% glyphosate solution. The labels suggested for this concentration include, AquaNeat manufactured by Nufarm or AquaMaster manufactured by Monsanto.

Toxicity of glyphosate formulations is rated low, medium, or high. (US Forest Service 2011). Both AquaNeat and Aqua Master are considered to be low toxicity and do not contain polyethoxylated tallow amine (POEA) as a surfactant that is found in other formulations of glyphosate. POEA has been shown to be more toxic than glyphosate itself (Folmar et al. 1979, Wan et al. 1989) especially when applied in alkaline waters which are common on the refuge.

Glyphosate exposure to humans during or after a glyphosate application include direct exposure from spray, drift or chemical spillage or contact with treated vegetation. Chemical mixing and application and re-entry would be done according to label specifications. Generally this would only involve applicator personnel. Most applications will be done in areas closed to the public. Refuge personnel will make sure all areas are cleared of all people that could be exposed to the chemical application. Re-entry times indicated on the chemical label would be enforced in closed areas and in areas open to the public.

Where glyphosate has been applied, wildlife can be exposed in a number of ways including direct spray and drift, direct exposure to contaminated water or vegetation, or ingestion of contaminated water, vegetation or prey animals. Aerial glyphosate application will generally be done in late summer when most wildlife breeding activities have ceased to minimize direct exposure to the chemical.

Glyphosate has a relatively low oral and dermal acute toxicity. It has been placed in Toxicity Category III, with Category I being the highest degree of toxicity and IV being the lowest (US Environmental Protection Agency 1993). Toxicity to eyes is higher and is often caused during mixing (splashing) of the herbicide. An acute inhalation toxicity study was waived because glyphosate is non-volatile and because adequate inhalation studies with end-use products show low toxicity. Tests related to carcinogenicity showed that the chemical is not carcinogenic. In developmental toxicity studies using pregnant rabbits and rats, glyphosate in high doses caused diarrhea, decreased body weight gain, nasal discharge, and death. It did not cause mutations.

Toxicity of glyphosate on invertebrates and amphibians is not fully known. Studies have shown that an affect does occur. Bullfrog tadpoles exposed to 1 ppm dosage had increased heart rates and higher activity, potentially affecting their survival (Costa et al. 2008). Amphipods, an important link in the aquatic food chain, showed stress and lower survival when exposed to glyphosate (Dutra et al. 2011). Effects included lower levels of proteins, lipids, triglycerides and egg production. Evans et al. (2010) reported that terrestrial arthropods exhibited lower survivorship when exposed to glyphosate, suggesting the herbicide can affect arthropod community dynamics, reducing biological control of other organisms.

4.2 Wildlife and Habitat Impacts

Under the No Action alternative only ground application of glyphosate with truck, tractor, ATV, or amphibious vehicle would be allowed. Treatments would be primarily limited to the drier, smoother terrain portions of the refuge. Phragmites located in the inaccessible portions of the refuge would remain largely untreated and continue to provide a seed source to other parts of the refuge and to privately-owned neighboring lands. Rutting caused by tractor tires in marginal dry areas will encourage weed establishment along the tire path. In some cases amphibious tracked vehicles may be used, however, these vehicles are costly to operate and soil compaction and rutting would also occur. Glyphosate can be applied in some areas using an airboat, however this generally only involves spot treatments of small patches.

The amount of area treated annually using ground spraying applications is limited due to the time it takes to treat an area. Often the same area has to be treated for 2-3 successive years to get control. Further, applying glyphosate evenly on the landscape can be difficult using ground equipment due to uneven terrain which reduces the operator's ability to maintain a constant speed.

Under the No Action Alternative, wildlife habitat and bird use would likely continue to decline in some areas with just using ground spraying as Phragmites would continue to dominate in untreated areas. Management costs for labor, fuel, and equipment maintenance would remain high and any disruption in weed control in one year would compound the problem in future years.

Aerial treatment of Phragmites under the Preferred Alternative will allow for larger areas to be treated annually resulting in an acceleration of Phragmites control across the refuge. Aerial application will allow for more timely application, more even distribution of the herbicide on the leaf portion of the plant, lower levels of overspray, and increased safety for the applicator.

Also see the discussion in Section 4.1 above regarding effects of the chemical on wildlife regardless of application method used. Both ground and aerial application will result in exposure to wildlife. Where possible wetland units will be dried up prior to application, which should reduce exposure to aquatic organisms under either application method. Aerial application of glyphosate would allow for larger areas to be treated more efficiently which should result in less chemical being used over time and therefore less exposure to wildlife over time.

Grazing, mowing, and fire are effective methods for removing top growth helping to make spray treatments more effective under either alternative. However, since these methods alone do not eliminate Phragmites, spraying is still required. Because these applications remove the vegetation structure, their use has to be timed to avoid impacting the habitat needs of nesting migratory birds.

Using aerial spraying to cover larger areas will benefit grassland nesting species, such as cinnamon teal (*Anas cyanoptera*) and other upland nesting waterfowl, long-billed curlew (*Numenius americanus*), savannah sparrow (*Passerculus sandwichensis*), and western meadowlark (*Sturnella neglecta*). Water-associated species, including ducks, geese, and shorebirds will benefit. Plant diversity and the diversity of fauna associated with healthy grassland and wetlands should increase faster under an aerial spraying scenario.

4.3 Listed Species

No federal or state listed Threated and Endangered species currently occur on Bear River Migratory bird refuge.

4.4 Public Safety/Use

Some areas to be treated are open to public use. Public contact with glyphosate would most likely occur from direct contact with the spray or drift or contact with treated plants. Public areas would be closed where needed at least 24 hours prior to treatment and remained closed for 48 hours after treatment under either alternative to eliminate exposure to the herbicide.

Any closure would be only for a few days and therefore, the impact on public use would be minimal.

4.5 Worker's Safety

Operation of equipment, including tractors and all-terrain vehicles (ATV) is expected to have significant safety concerns for Refuge employees. The rough terrain includes small mounds and depressions caused by burrowing animals, including badger, gophers, and ants. Wet areas have muck substrate that is not traversable with wheeled vehicles. Application of herbicide from a tractor or ATV in these conditions increases the chances of equipment breakage— increasing the potential for high exposure to the chemical. Direct contact with glyphosate by applicators most commonly occur during the mixing. The frequent mixing of chemical for small volume sprayers increases the chances of a mishap. Though aerial application has obvious risks, overall risk to workers should be somewhat minimized due to being able to apply glyphosate over a larger area in a shorter amount of time. Glyphosate application under either alternative will be done according to the label and by certified applicators or under the direct supervision of a certified applicator.

4.6 Timeliness of Application

Most research on Phragmites control suggests fall treatment is the best time. Since glyphosate is a systemic herbicide, treatment should be delayed until plants are translocating sugars from the leaves to the rhizomes. Because glyphosate affects living plant tissue and applications may be near areas of desired vegetation, it is important to delay application until native grasses and forbs have become dormant.

However, the refuge has been experimenting with some mid-summer treatments before plants produce seed since research has shown that reproduction from seeds is significant on the Refuge (Kettenring and Mock 2011). Preliminary results look promising. Under both alternatives, spraying may be done earlier in the summer in large stands of Phragmites where non-target effects will be minimized.

4.7 Historic Properties and Cultural Resources

There are no documented historical properties on Refuge lands that would be affected by either the No Action or the Preferred Alternative.

4.8 Cumulative Impact Analysis of the No Action Alternative

The primary cumulative effect of using existing methods under the No Action Alternative would be partial control of the weed species. Areas missed by broadcast spraying would serve as seed sources for future plant production. Additionally, the monetary cost of control under the No Action Alternative would ultimately be higher than if aerial spraying was used.

4.9 Cumulative Impact Analysis of the Proposed Action

Aerial treatment of Phragmites will allow for larger areas to be treated annually resulting in an acceleration of Phragmites control across the refuge, which should in the long term future reduce the amount of herbicides need to maintain control. Future occurrences of Phragmites can be better treated with spot-spraying rather than broadcast spraying.

SECTION 5: REGULATORY COMPLIANCE

5.1 Relationships to the Clean Water Act, Section 402: National Pollutant Discharge Elimination System (NPDES).

This NPDES general permit is issued in compliance with the provisions of the Federal Water Pollution Control Act (33 U.S.C. Secs. 1251 *et. seq*. as amended to date), the Utah Water Quality Act, title 19, Chapter 5, Utah Code Annotated 1953, as amended and the Rules and Regulations promulgated pursuant to these Acts. Bear River Migratory Bird Refuge will adhere to the requirements set for by the state of Utah as established by Section 402 of the Clean Water Act. The Act allows the state of Utah to develop a general permit authorizing pesticide applications to, over, or near waters of the Utah. The goal of the general permit is to reduce or eliminate pollution from the discharges of pesticides by requiring implementation of best management practices to protect water quality.

Application will be made for this aerial project to be implemented under this general permit for authorization to discharge pesticides and their residuals to, over, or near, waters of the State of Utah. Owners, operators, and applicators issued a discharge authorization under this general permit are required to comply with the limits, requirements, prohibitions, and conditions set forth herein. Authorization under this general permit does not relieve applicators or permittees of other duties and responsibilities under the Utah Water Quality Act, as amended, or established by regulations promulgated pursuant thereto.

5.2 Fish and Wildlife Service Pesticide application regulations

The US Fish and Wildlife Service has its own regulations and procedures for using pesticides. All pesticide use on refuges requires an individual Pesticide Use Proposal (PUP) for each chemical which specifies the target pest(s), the method of application and the timing and location of application.

These PUPs can be approved (or disapproved) at the Refuge, Regional, or National level depending on the pesticide being proposed and method of application. Additionally, required Best Management Practices are followed during the chemical application.

SECTION 6: UNAVOIDABLE ADVERSE EFFECTS

Glyphosate affects all actively growing plants. Late summer or early fall applications should reduce or eliminate the impact on most adjacent plants. However, some collateral damage will occur. This loss is not expected to be significant and in some cases it may be beneficial as more dense vegetation is opened up for wildlife use. Additionally, treatment areas do not contain rare plants. Follow-up seeding of native plants may be done in some areas.

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SECTION 8: TABLES AND FIGURES

Figure 1. Location of Bear River Migratory Bird Refuge, Brigham City, Utah.

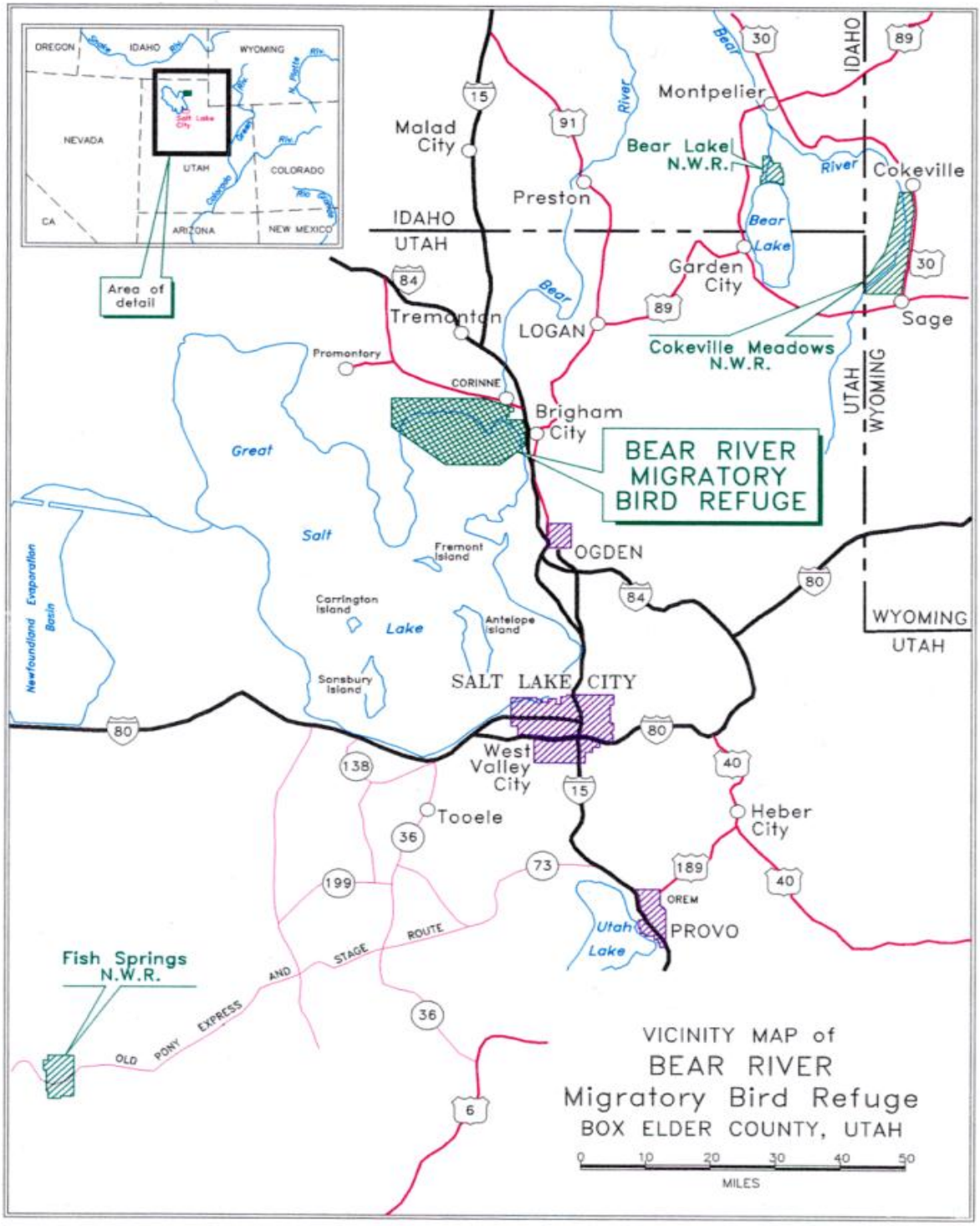

Figure 2. Bear River Migratory Bird Refuge Management Units

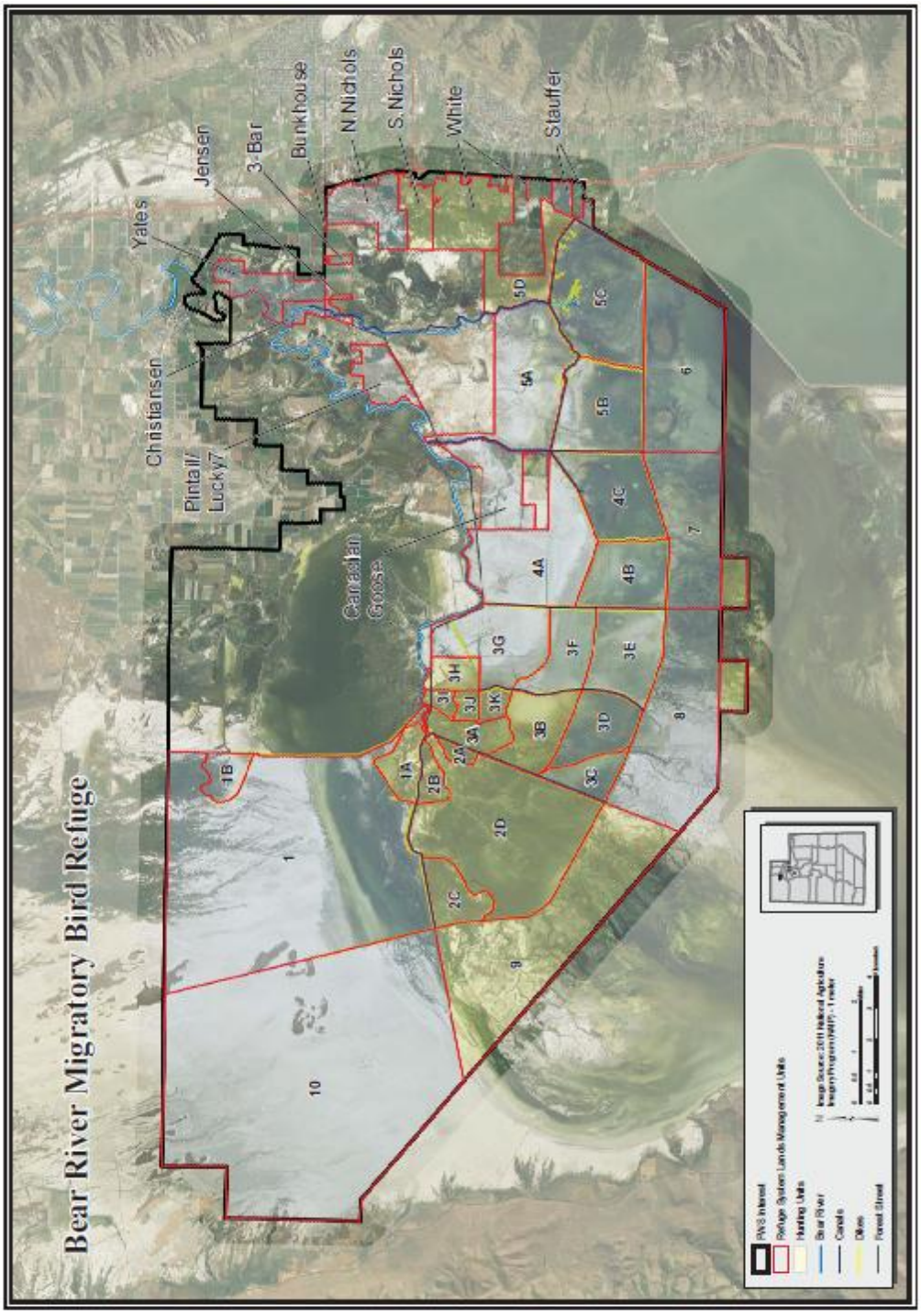

Figure 3. Vegetation map showing eastern portions of Bear River migratory Bird refuge. The light green coloration shows the extent of Phragmites (Long et al. 2012).

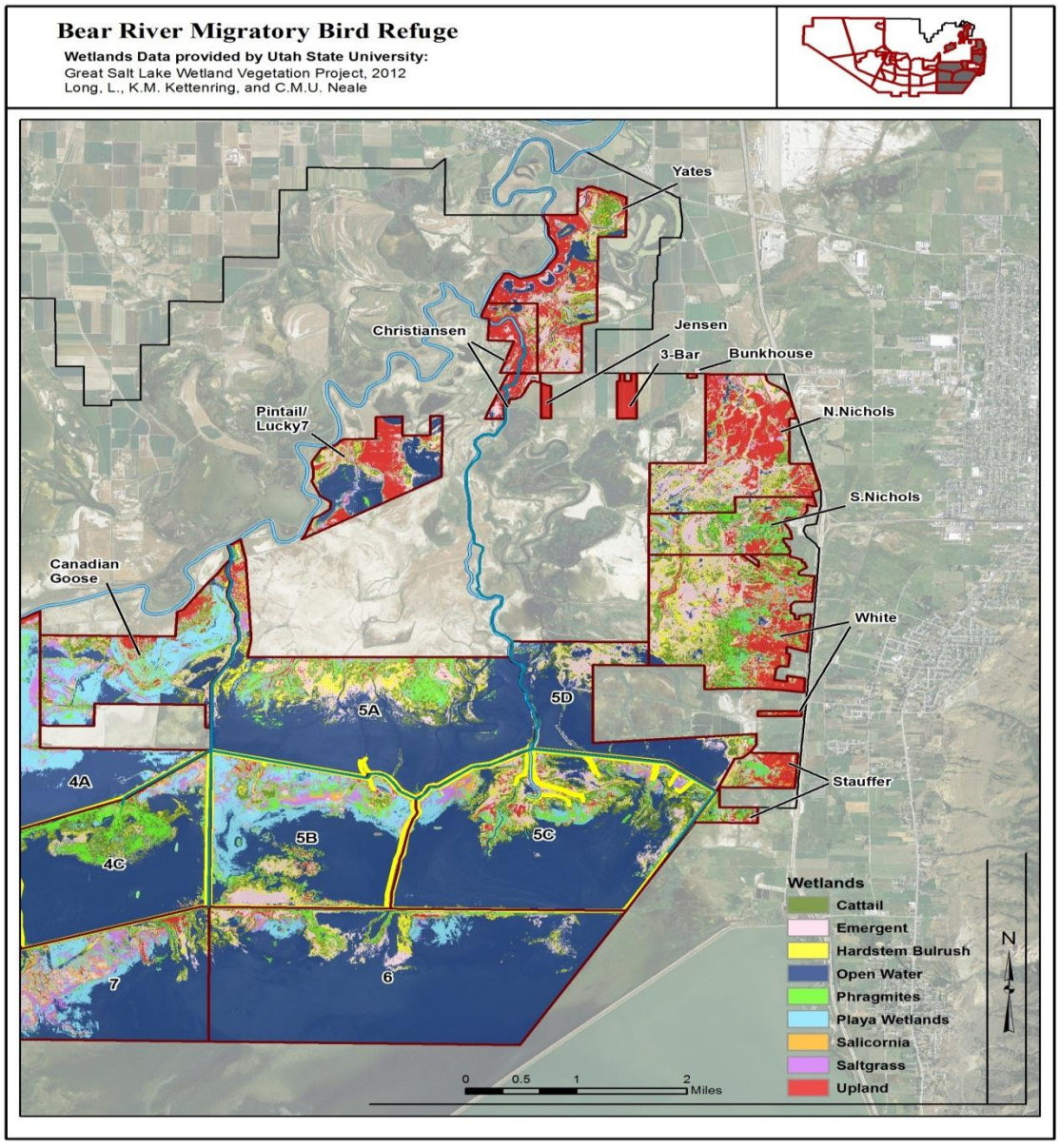

Figure 4. Vegetation map showing the middle portions of Bear River migratory Bird refuge. The light green coloration shows the extent of Phragmites (Long et al. 2012).

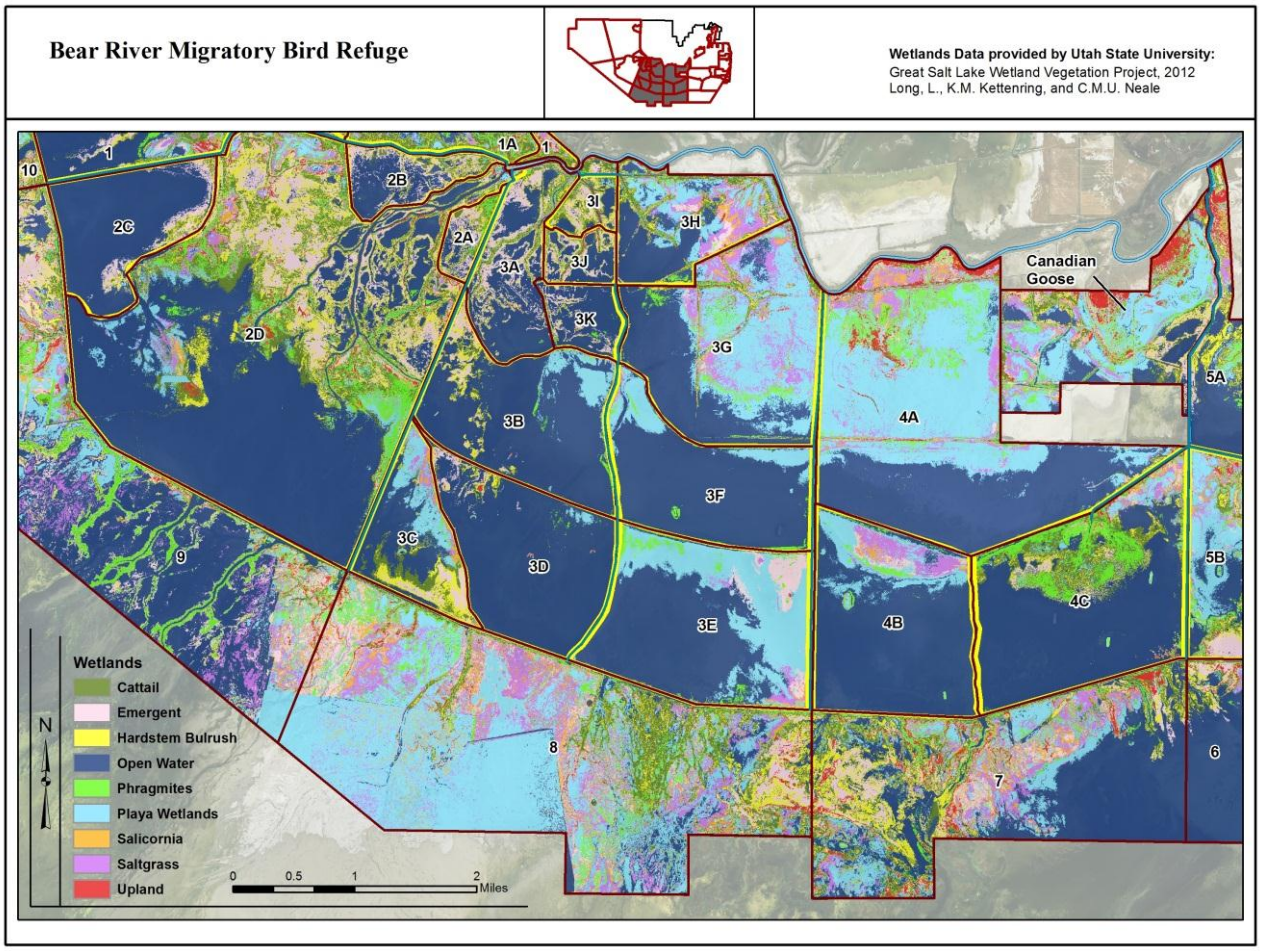

Figure 5. Vegetation map showing western portions of Bear River migratory Bird refuge. The light green coloration shows the extent of Phragmites (Long et al. 2012).

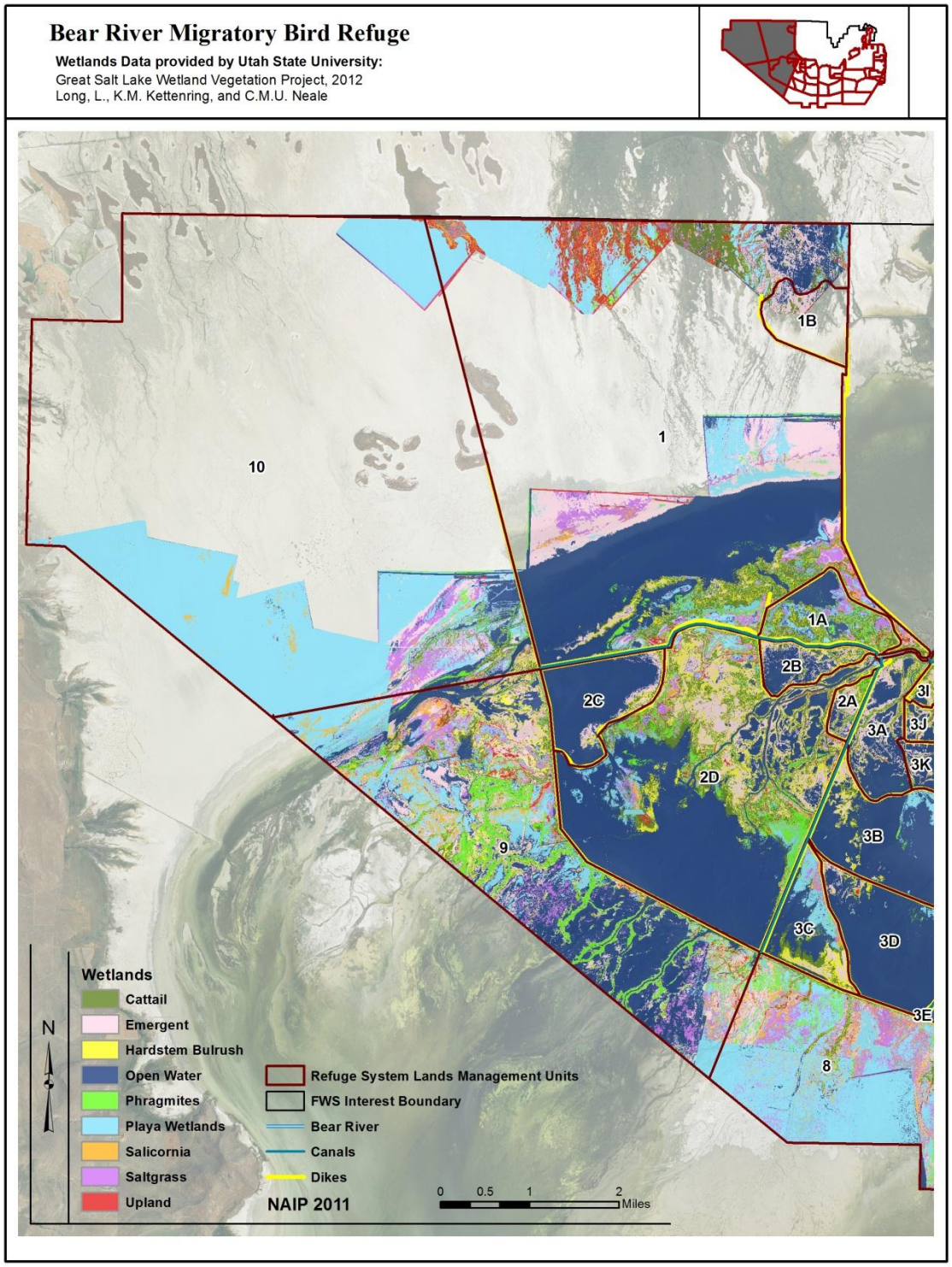

Table 1. Priority species and ranking factors, Bear River Refuge

Priority Rank & Species	Ranking Factors
1 American Avocet	* Refuge, as part of GSL hosts up to 14% of continental breeding population (Refuge alone 1%). * Refuge as part of GSL hosts up to 55% of continental population during migration (Paul and Manning 2002).
2 Cinnamon Teal	* Northern Utah marshes host up to 60% of continental breeding population (Bellrose 1980).
3 Black-necked Stilt	* Refuge, as part of GSL hosts 79% of IMW migrating birds (Shurford et al. 2002). * Refuge hosts 2% of continental breeding population (Refuge records).
4 White-faced Ibis	* Refuge, as part of GSL hosts world's largest breeding colony (USFWS 1982).
5 Shorebirds	* Refuge, as part of GSL recognized as WHSRN Hemispheric Site. * Refuge hosts an average spring (April-May) population of 18,000 shorebirds and hosts an average fall (July-September) population of 69,000 shorebirds.
6 Waterfowl	* Refuge hosts an average 11,000 (July 1-14) molting Northern Pintail. * Refuge hosts an average spring (March-April) peak population of 119,000 waterfowl and an average fall peak (1st week of Oct.) of 263,000 birds. * Refuge can host up to < 500,000 waterfowl in fall.
7 Tundra Swan	* Refuge and adjacent Bear River Club, host up to 30% of Western Population of Tundra Swan (Refuge15%).
8 Snowy Plover	* Refuge, as part of GSL hosts >50% of continental breeding population (Page et al. 1991).
9 Marbled Godwit	* Refuge and GSL hosts up to 86% of IMW region's Marbled Godwit (Shuford et al. 2002). * Refuge as part of GSL, only known inland staging area in North America (Shuford 1994). * Refuge peak (43,000) is 25% of continental population.
10 Long-billed Curlew	* Refuge historic records of 50 breeding pair makes Refuge important breeding site in IMW.
11American White Pelican	* Refuge is most important foraging site in GSL for Pelican. * The GSL colony is one of three largest in North America (Parrish et al. 2002).
12 Redhead	* Bear River delta noted as having the highest breeding concentration known in North America (Weller 1964).
13 Wilson's Phalarope	* GSL recognized as largest staging area in world (Jehl 1988).
14 Long-billed Dowitcher	* The Refuge, as part of GSL hosts 39% of IMW population during migration which is equivalent to 3% of the continental population. * Refuge fall population is 1% of continental population.
15 Franklin's Gull	* The GSL staging population is 9.2% of continental population. * Refuge breeding population is 0.8% of continental population and 13% of the Utah population.
16 Black Tern	* Historic Refuge records indicate Refuge could host >20 pair which is 33% of Utah objective of 60 pair. * Refuge, as part of GSL may host 9% of Great Basin population during migration